1. A telemetry system for transmitting well-logging data from at least one downhole tool to a surface data acquisition system, the at least one down hole tool having a first tool data input/output interface, the telemetry system comprising:

a. a downhole telemetry cartridge connected to the at least one downhole tool via a second tool data input/output interface connected to the first tool data input/output interface, wherein the downhole telemetry cartridge receives a bitstream from the at least one downhole tool over the second input/output interface and comprising:

a transmitter connected to the second tool data input/output interface, and

having a logic operable to cause transmission of the bitstream as analog signals on a plurality of carrier frequencies;

b. an uphole telemetry unit connected to the surface data acquisition system via an acquisition computer interface and comprising

a receiver connected to the surface data acquisition system and having logic operable to receive the analog signals on the plurality of carrier frequencies, to demodulate the received signals into a bitstream, and to output the bitstream to the acquisition computer via the acquisition computer interface; and

c. a wireline cable providing an electrical connection between the downhole telemetry cartridge and the uphole telemetry unit, wherein the analog signals are transmitted in an uphole direction on the wireline cable.

2. The telemetry system of Claim 1, wherein the downhole telemetry cartridge is integrated into one of the at least one downhole tool.

3. The telemetry system of Claim 1, wherein the downhole telemetry cartridge further comprises a sample clock operating at a sampling rate within the range of 300 kHz to 500 kHz.

4. The telemetry system of Claim 1, wherein the downhole telemetry cartridge further comprises:

a cable driver connected to the cable interface and having power optimization logic to adjust total output power of the analog signal to a power level optimized for the wireline cable.

5. The telemetry system of Claim 4, wherein the cable driver operates from a voltage supply of a range of at least -15 volts and 15 volts.

6. The telemetry system of Claim 4, wherein the cable driver operates to drive the total output power to the maximum input tolerance power level of the receiver.

7. The telemetry system of Claim 6, wherein the cable driver operates to drive the total output power without consideration for cross-talk with other signals.

8. The telemetry system of Claim 3, wherein the cable driver further comprises:

power level control circuitry having logic to control the transmission power to optimize the total transmission power applied to the wireline cable as a function of a received signal which is a function of cable length, cable material, cable temperature, and cable geometry.

9. The telemetry system of Claim 1, wherein the uphole signal is transmitted in a first propagation mode and wherein the uphole telemetry unit further comprises:

an uphole transmitter operable to transmit control signals from the data acquisition system to the at least one downhole tool, wherein the control signals are transmitted simultaneously in a second propagation mode that is different from the first propagation mode.

10. The telemetry system of Claim 1, wherein the downhole telemetry cartridge further comprises logic to cause transmission of signals on a first propagation mode and the uphole telemetry unit further comprises logic to cause transmission of signals in the first propagation mode.

11. The telemetry system of Claim 1, wherein the uphole signal is transmitted on a first set of wires and wherein the uphole telemetry unit further comprises:

an uphole transmitter operable to transmit control signals from the data acquisition system to the at least one downhole tool, wherein the control signals are transmitted simultaneously on a second set of wires that is different from the first set of wires.

12. The telemetry system of Claim 1, wherein power level is optimized for signal-to-noise ratio for each frequency band, wherein the cable driver further comprises:

power level control circuitry having logic to independently control the transmission power of each carrier frequency; and

wherein the receiver further comprises logic operable to cause the transmission from the receiver to cable driver of a control signal indicative to the power level control circuitry to increase or decrease the transmission power for any carrier frequency.

13. The telemetry system of Claim 1, wherein power level is optimized for signal-to-noise ratio for each frequency band, wherein the cable driver further comprises:

power level control circuitry having logic to control the total transmission power applied to the wireline cable; and

wherein the receiver further comprises logic operable to cause the transmission from the receiver to cable driver of a control signal indicative to the power level

control circuitry to increase or decrease the total transmission power applied to the wireline cable.

14. The telemetry system of Claim 1, further comprising:

a tone ordering logic operable to divide the bit stream into bit groups such that there is a one-to-one mapping between bit groups and carrier frequencies;

a downhole bits-per-carrier table containing a mapping between each bit group and the number of bits allocated to each carrier for each cycle of operation;

a constellation encoder connected to receive the bit groups from the tone ordering logic and the bits-per-carrier from the bits-per-carrier table, and operable to encode the bit groups as complex numbers.

15. The telemetry system of Claim 14 further comprising:

a training logic operable to populate the bits-per-carrier table.

16. The telemetry system of Claim 15 wherein the training logic comprises a downhole training logic and an uphole training logic and wherein the downhole training logic comprises

logic operable to transmit a known signal on each of a plurality of carriers; and

logic operable to receive the number of bits-per-carrier from the uphole telemetery unit; and

the uphole training logic comprises

logic operable to measure the signal-to-noise ratio on the received known signals;

logic operable to determine the number of bits-per-carrier as a function of the signal-to-noise ratio; and

logic operable to cause the transmission of the number of bits-per-carrier to the downhole telemetry cartridge.

17. The telemetry system of Claim 16 wherein the downhole telemetry cartridge further comprises logic to populate the downhole bit-per-carrier table with the received number of bits-per-carrier; and

wherein the uphole telemetry unit further comprises an uphole bits-per-carrier table and a logic to populate the uphole bits-per-carrier table with the same number of bits-per-carrier.

18. The telemetry system of Claim 1 wherein the uplink transmission of data uses a first modulation technique and the downlink transmission of data uses a second modulation technique.

19. The telemetry system of Claim 18 wherein the uplink transmission uses discrete-multi-tone modulation and the downlink uses bi-phase modulation.

20. The telemetry system of Claim 1, wherein the downhole telemetry cartridge is constructed from components capable of operation at temperatures above 150 degrees Celsius.

21. A method of operating a well-logging telemetry system having a downhole telemetry cartridge and an uphole telemetry unit connected by a wireline cable, comprising:

transmitting a known signal on each of a plurality of carriers from the downhole telemetry cartridge to the uphole telemetry unit;

measuring at the uphole telemetry unit the signal-to-noise ratio on the known signal on each of the plurality of carriers;

using the signal-to-noise ratio measurement to determine the number of bits-per-constellation to use for each carrier; and

populating a bits-per-carrier table with the bits-per-constellation value for each carrier.

22. The method of operating a well-logging telemetry system of Claim 21, wherein the step of populating a bits-per-carrier table comprises:

populating a bits-per-carrier table in the uphole telemetry unit and populating a bits-per-carrier table in the downhole telemetry cartridge.

23. The method of operating a well-logging telemetry system of Claim 21, further comprising:

acquiring well-log data from a well-logging tool; and

wherein at least one of the steps of transmitting a signal of known power, measuring the signal amplitude, comparing the power level received, transmitting an indication to adjust the power level, and adjusting the power level of at least one of the carriers is executed concurrently with the step of acquiring well-log data.

24. The method of operating a well-logging telemetry system of Claim 21 further comprising:

transmitting a known complex number from the downhole telemetry cartridge to the uphole telemetry unit;

receiving the transmitted complex number at the uphole telemetry unit;

dividing the received complex number by the known complex number thereby obtaining an adjustment parameter; and

using the adjustment parameter for time domain equalization.

25. The method of operating a well-logging telemetry system of Claim 21, further comprising:

transmitting a known complex number from the downhole telemetry cartridge to the uphole telemetry unit;

receiving the transmitted complex number at the uphole telemetry unit;

dividing the received complex number by the known complex number thereby obtaining an adjustment parameter; and

using the adjustment parameter for frequency domain equalization.

26. A method of operating a well-logging telemetry system having a downhole telemetry cartridge and an uphole telemetry unit connected by a wireline cable, comprising:

transmitting a signal of known power level on each of a plurality of carriers from the downhole telemetry cartridge to the uphole telemetry unit;

measuring the signal amplitude received on each carrier;

comparing the power level received on each carrier to a predetermined maximum power level for each carrier;

based on the comparison of power level, transmitting an indication to adjust the power level on at least one of the carriers from the uphole telemetry unit to the downhole telemetry cartridge;

adjusting the power level of at least one of the carriers based on the indication received.

27. A method of operating a well-logging telemetry system having a downhole telemetry cartridge and an uphole telemetry unit connected by a wireline cable, comprising:

modulating a bit stream onto a plurality of carrier frequencies;

transmitting the modulated bit stream on a first propagation mode from the downhole telemetry cartridge to the uphole telemetry unit; and

operating the uphole telemetry unit to demodulate the received bitstream.

28. The method of operating a telemetry system of Claim 27, further comprising:

using a training sequence to populate a bits-per-carrier table in the downhole telemetry cartridge and a bits-per-carrier table in the uphole telemetry unit;

wherein the step of modulating the bit stream onto a plurality of carrier frequencies modulates the bit stream for each carrier according to values stored in the downhole bits-per-carrier table for such each carrier; and

wherein the step of demodulating the bit stream demodulates the bit stream from each carrier according to values stored in the uphole bits-per-carrier table.

29. The method of operating a telemetry system of Claim 27, further comprising:

using a training sequence to populate a downhole gain table in the downhole telemetry cartridge and an uphole gain table in the uphole telemetry unit; and

adjusting the gain on each carrier based on values stored in the downhole gain table.

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